Blobs, bugs, twists and holes

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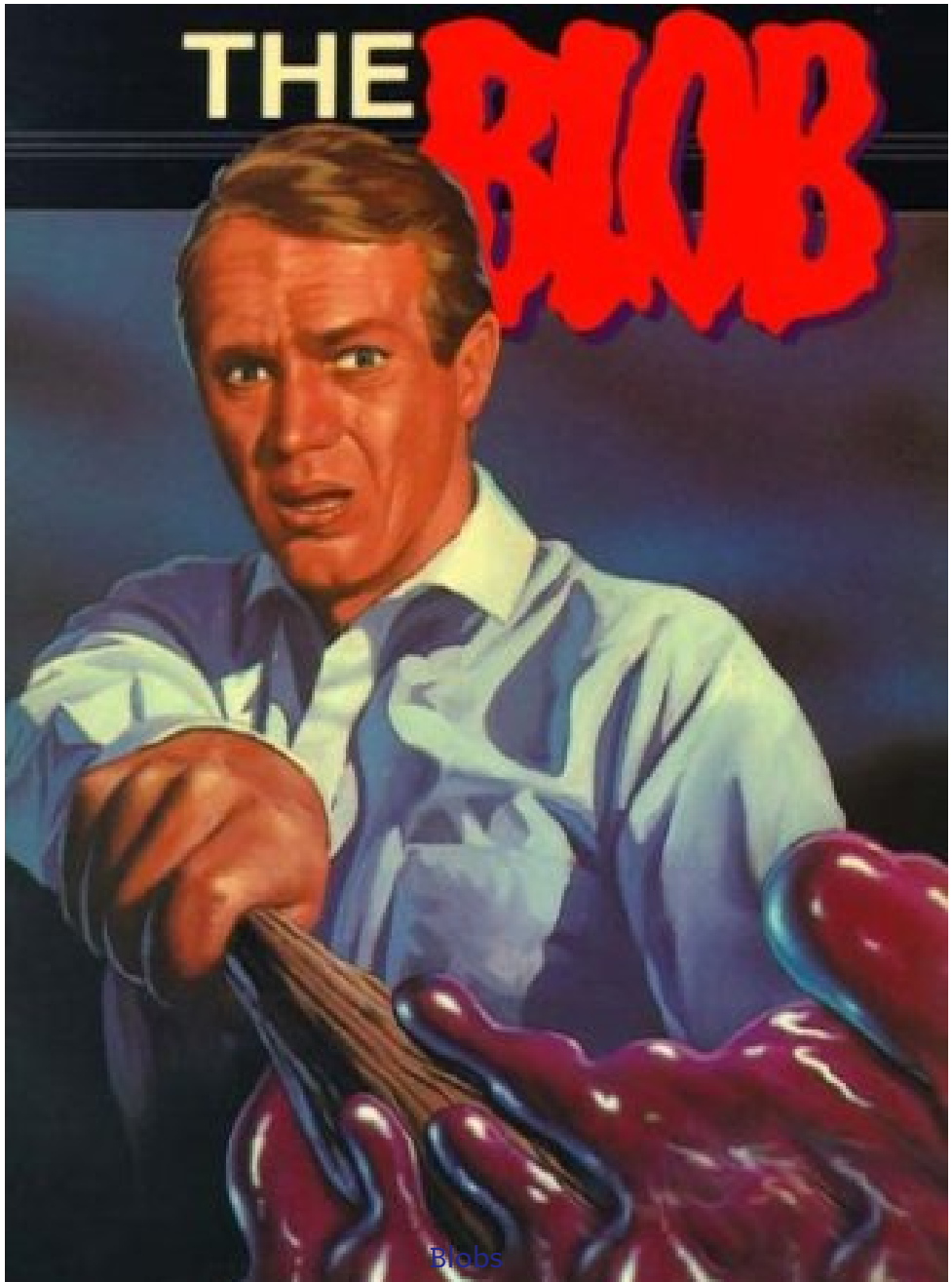
What is the sound of one AD clapping?

Several recent issues have raised questions about AD "identicality"

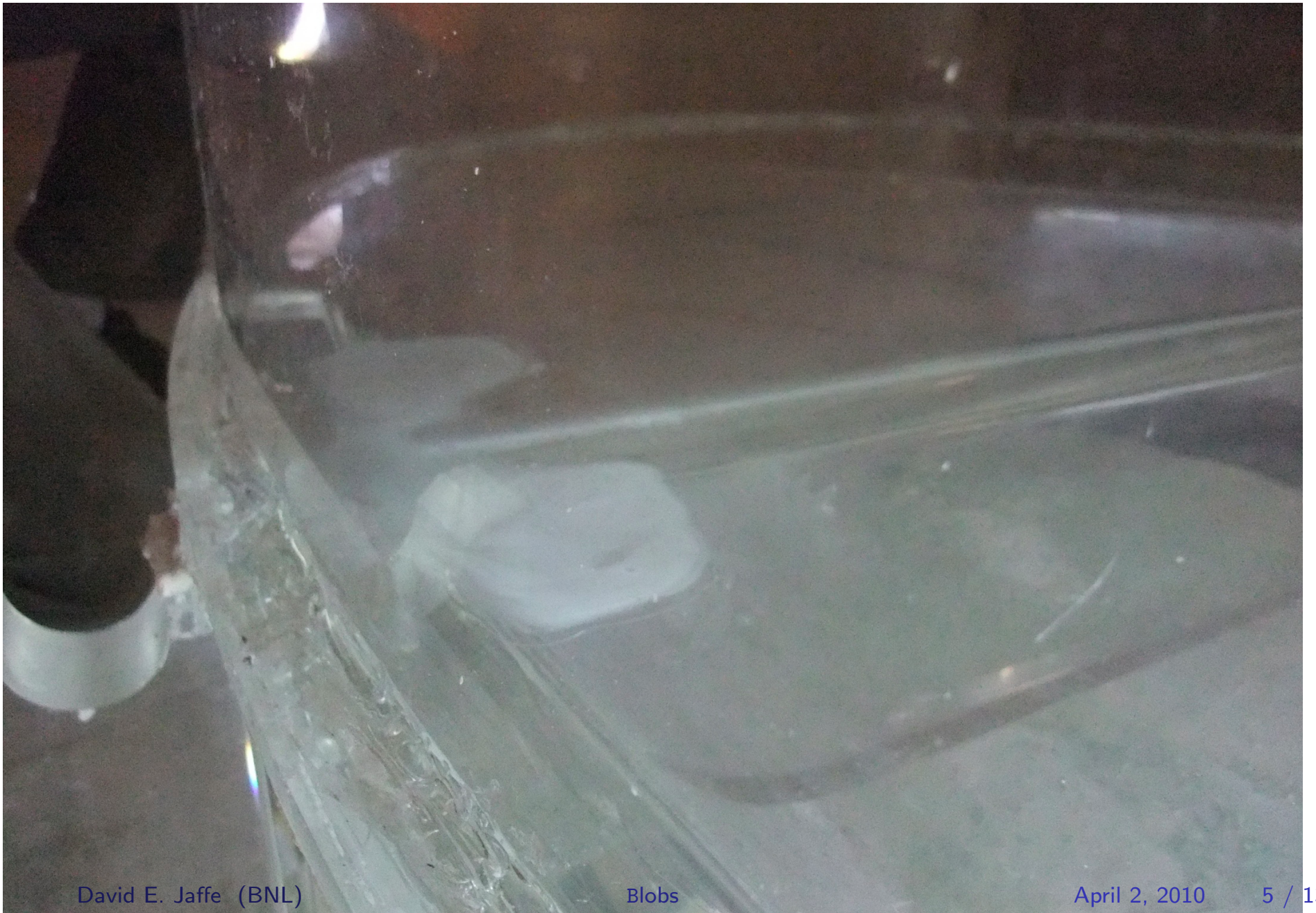
1. Blobs of glue on the IAV#3 lid (doc-4657)
2. 3 bugs entombed in IAV#2 (AD elog 557)
3. Off-axis port on IAV#1(?) off by 20 mm(AD elog 566)
4. Camera holes alter AD azimuthal symmetry (doc-4514)

The Blob



The blobs

The blobs

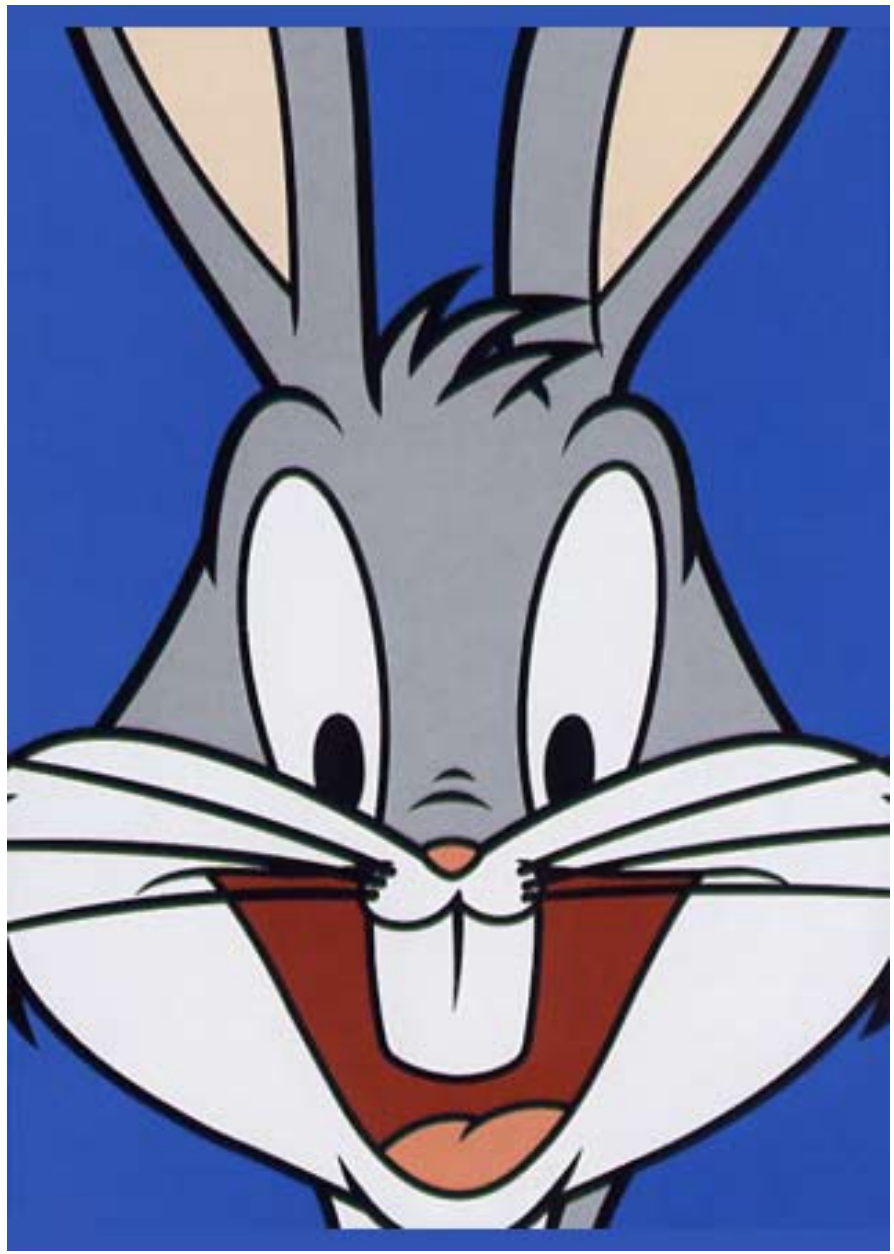


The blobs

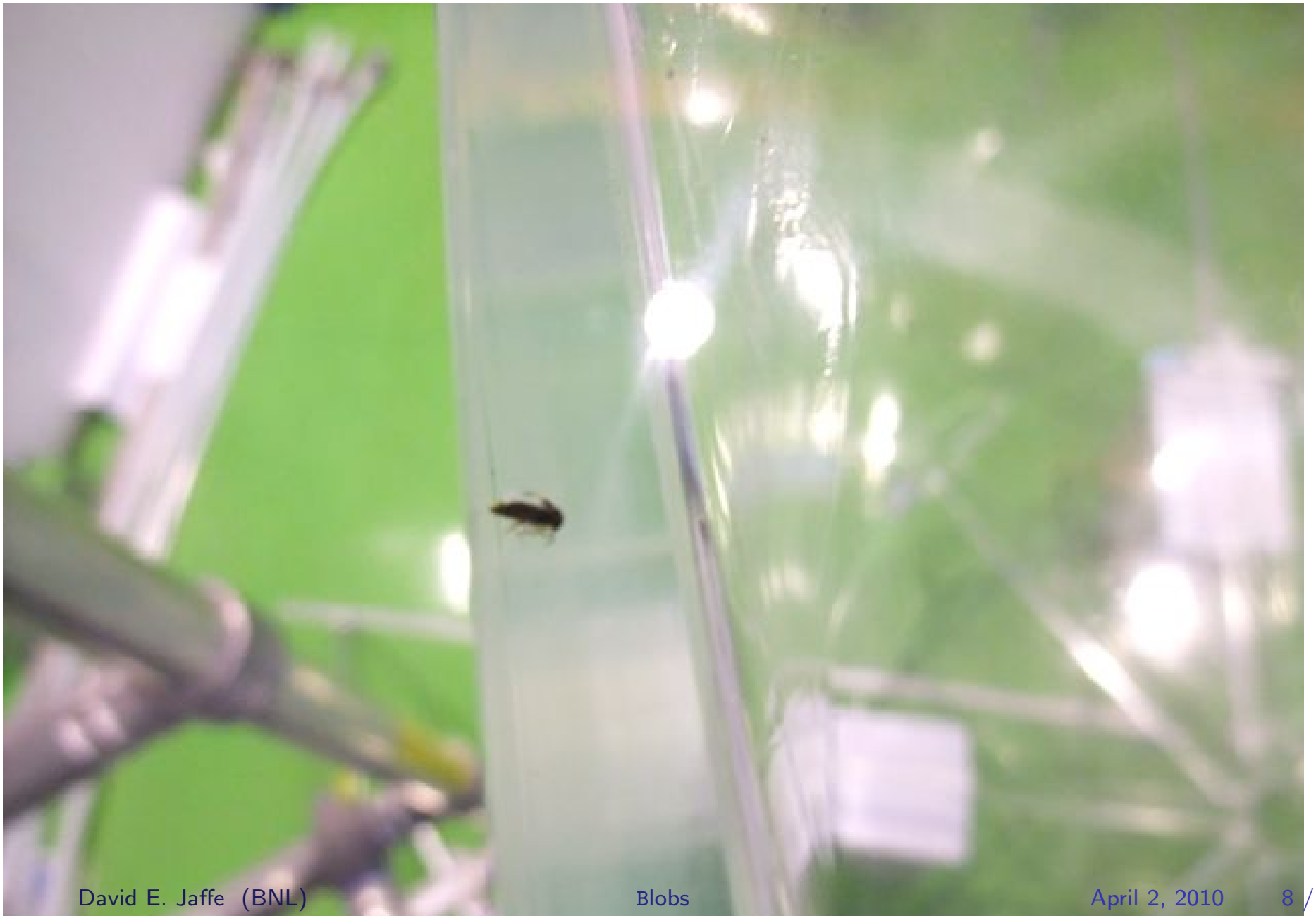
Bryce's analysis:

- Each blob is $\sim 30 \times 30$ cm^2, or $\sim 0.4\%$ of the total IAV area of 42400 cm^2.
- Do blobs remain translucent when immersed in LS?
- Simulate black spots and assess effect.

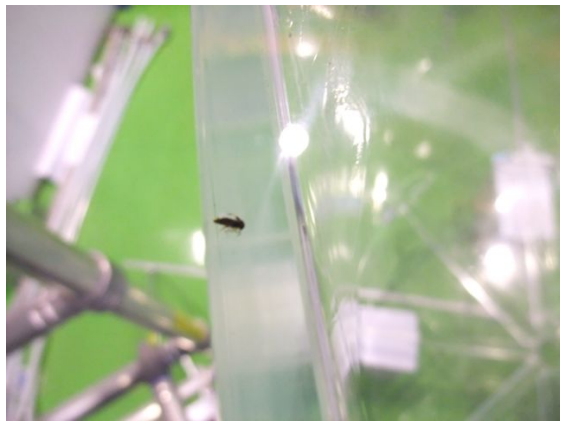
Bugs



Bugs

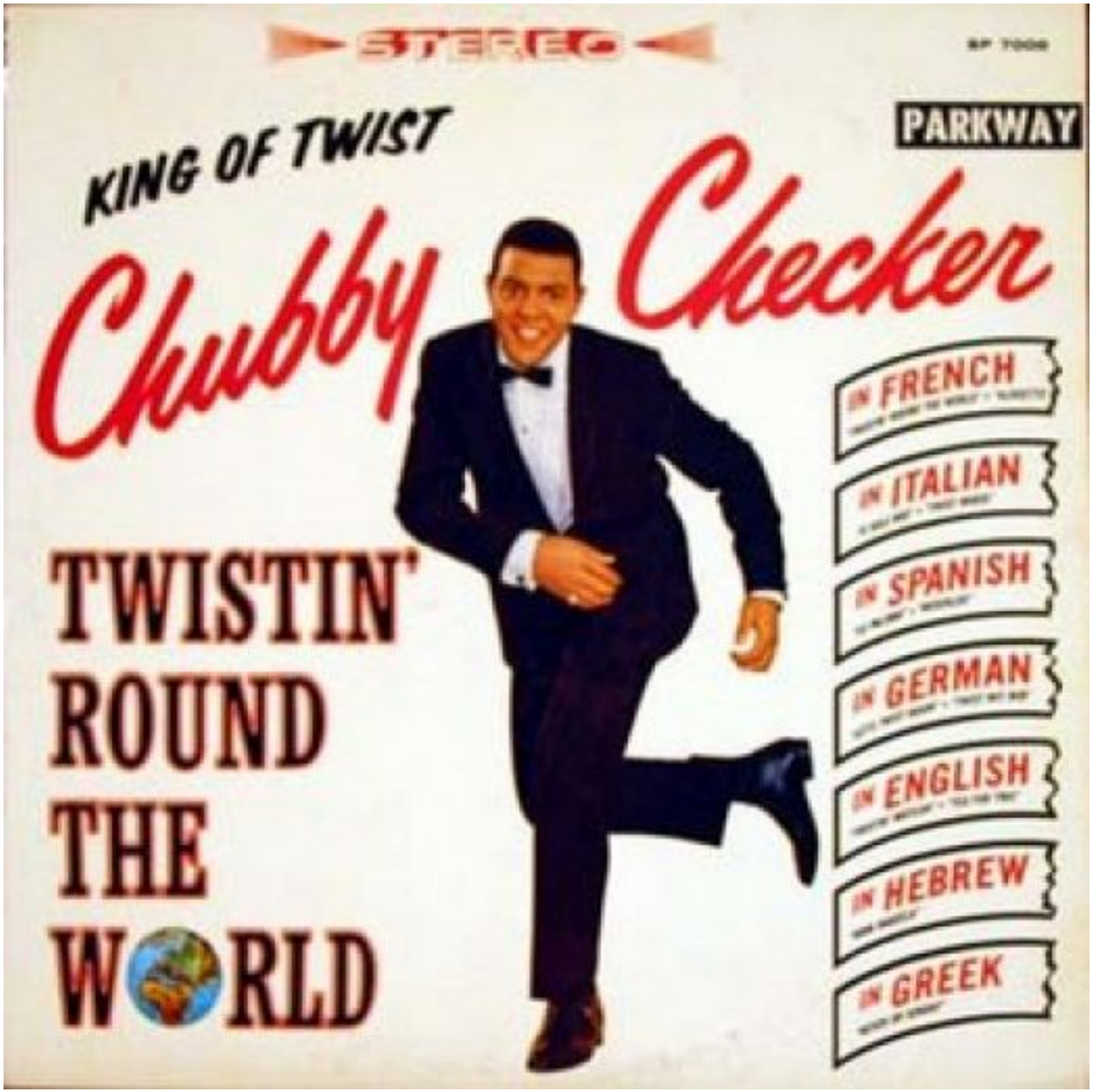


Bugs



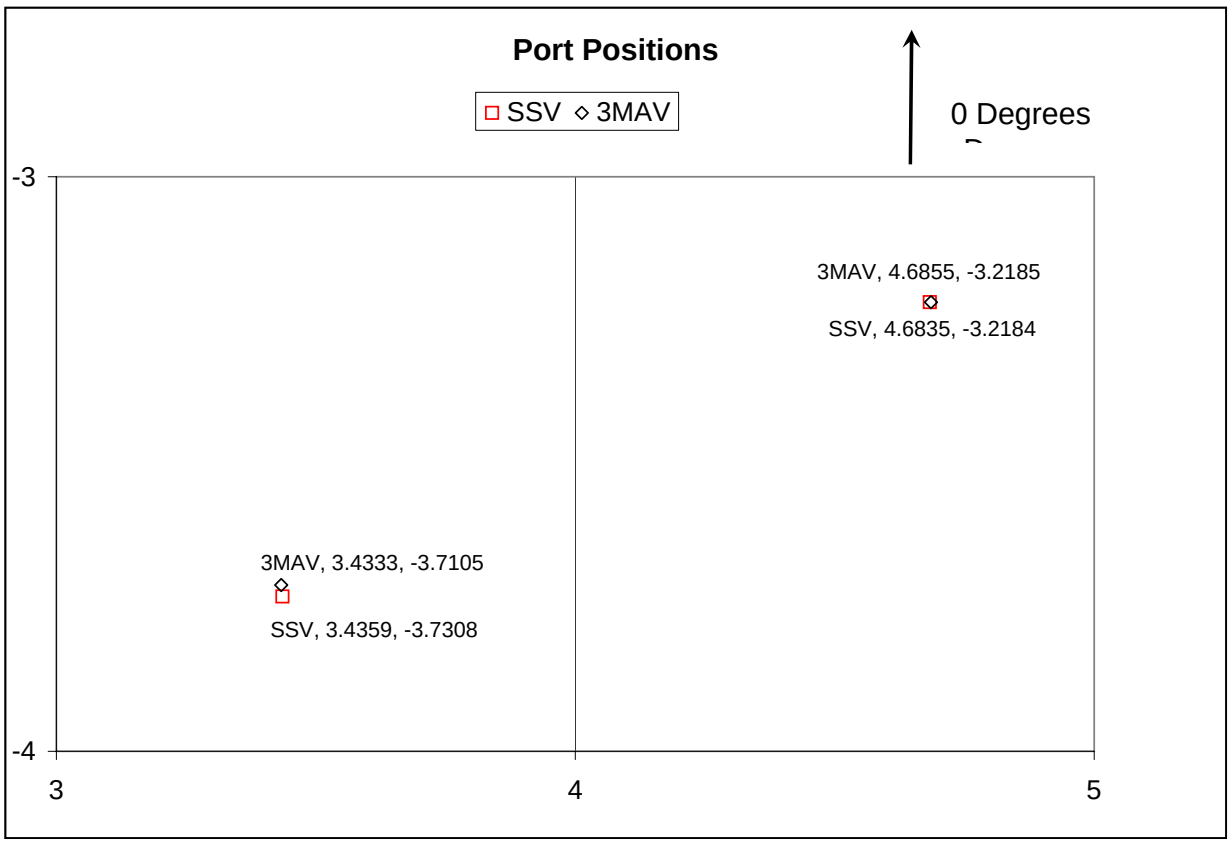
1. There are 3 bugs entombed in IAV#2.
2. Typical bug is 100 mg with typical fraction of potassium is $\sim$0.001. (doc-3889)
3. The natural abundance of ^{40}K is 1.17×10^{-4} and the half-life of ^{40}K is 1.248×10^{9} yr.
4. This implies $\sim$0.007 Hz per bug.
5. ^{40}K undergoes β^- decay $\mathcal{B} = 89.28\%$ with endpoint 1.3 MeV and electron capture $\mathcal{B} = 10.86\%$ that gives a 1460.8 keV γ 98% of the time.

Twist


STEREO
PARKWAY
KING OF TWIST
Chubby Checker
TWISTIN' ROUND THE WORLD
IN FRENCH
IN ITALIAN
IN SPANISH
IN GERMAN
IN ENGLISH
IN HEBREW
IN GREEK

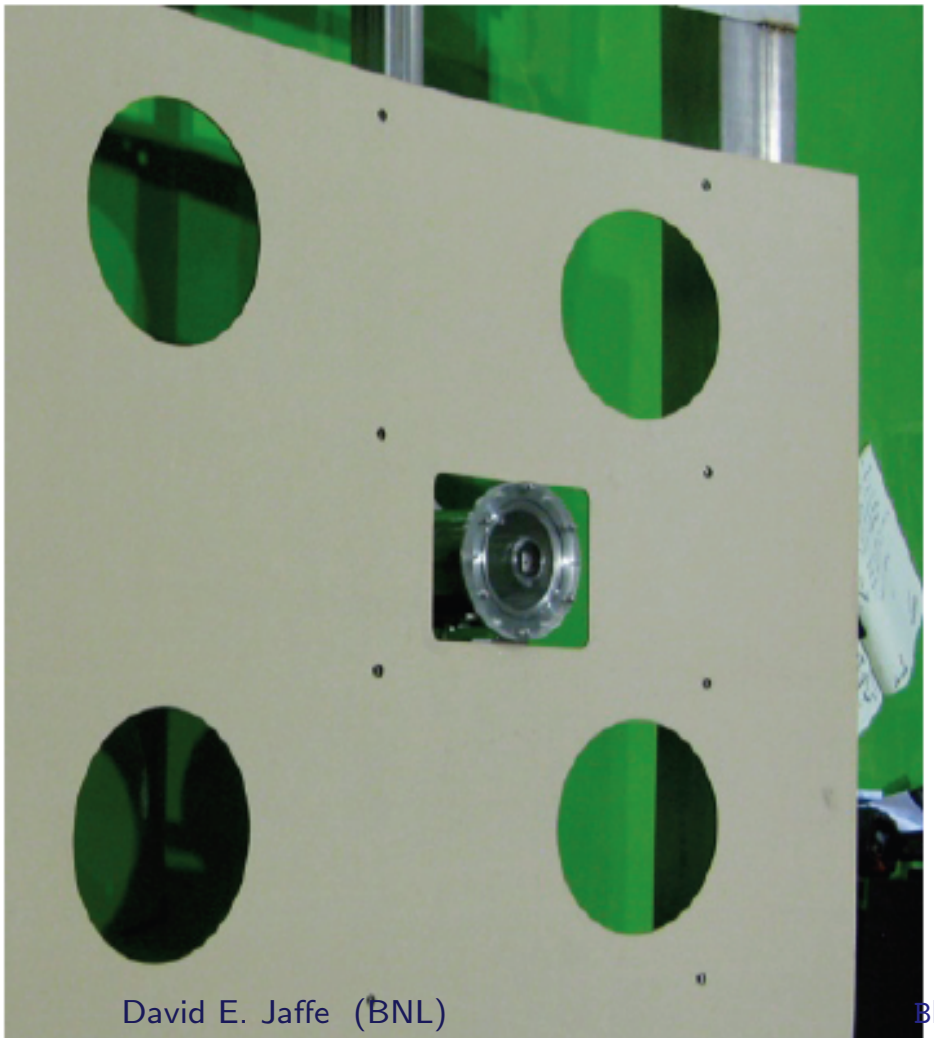
Twisted off-axis port on IAV#1

Port is off by 20mm. Previous studies have shown that ports alter the azimuthal symmetry of the AD response.

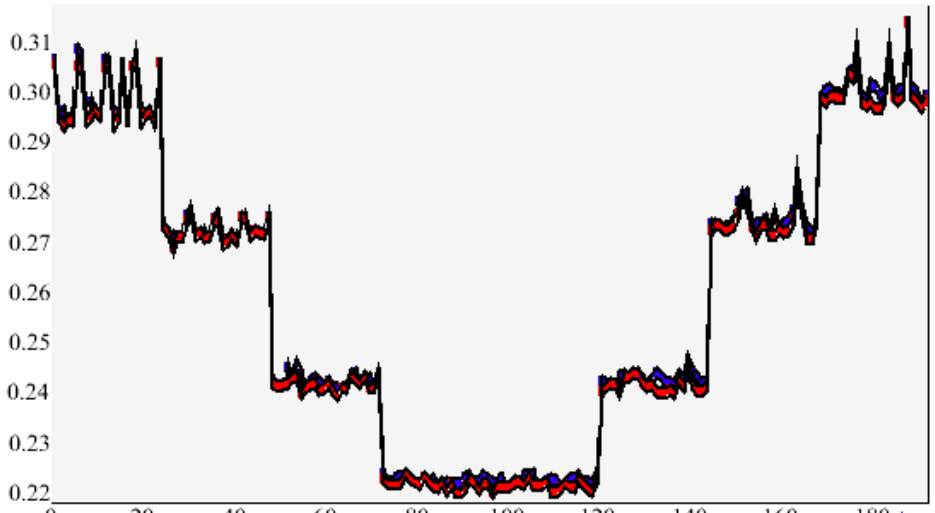


Holes

There are two camera holes (15×20 cm^2) compated to 32 m^2 area of reflectors and 41% of AD light is reflected. Total effect $\sim$0.1% on light yield.



Fraction of PMTs with >3 PE/event for 6 MeV γs uniformly distributed in GdLS *vs* PMT number. 0% reflective hole 100% reflective hole Width of band is uncertainty.



AD identicality

What does "identical AD" mean?

- Practically it means that, after calibration, all systematic effects cancel out between a near and far AD pair.
- The blob and off-axis port implies slightly different overall response ($< 0.5\%$) and larger differences as a function of position.
- The bugs imply 3 hot (warm) spots and a tiny change in the total rate of background radioactivity.